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ABSTRACT

While the efficacy of performance-based assessment has been fairly well established, the various physiological, theoretical, and practical benefits of process-based forms of performance assessment have not been well explored. This study examined the perceptions and practices of teachers and pre-teachers related to the soundness of process-based forms of assessment. Data were collected in three phases over a 1-year period from: (1) 11 teachers and 5 pre-service teachers; (2) 17 graduate student teachers, 14 graduate pre-service teachers, and 14 undergraduate pre-service teachers; and (3) 35 practicing teachers. Results indicate an interdependent relationship between the soundness of any assessment system and the (teacher)assessment instrument. The level of development of participants' assessment practices was found to be associated with a complex series of factors including experience, perceptions, training, inner dispositions, and the participant's evolving definition of the construct of "sound assessment." Highly evolved practitioners seemed to follow a similar developmental pattern. Process-based forms of assessment were found to be incorporated more by those who understood and appreciated both their value and the many technical considerations for their sound implementation. Implications for practice and professional development are offered. An appendix describes an applied technology process assessment procedure and discusses comparing assessment conditions in terms of soundness. (Contains 1 table and 19 references.) (SLD)

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Examining Practices and Perceptions related to the Soundness of Process-based Assessment by Experienced and Inexperienced Teachers

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Abstract

While the efficacy of performance-based assessment has been fairly well established, the various psychological, theoretical and practical benefits of process-based forms of performance assessment have not been well explored. This study examines the perceptions and practices of both teachers and pre-teachers related to the soundness of process-based forms of assessment. Data were collected in three phases over a one-year period. Results of the study indicate an interdependent relationship between the soundness of any assessment system and the (teacher) assessment instrument. The level of development of participants' assessment practices was found to be associated with a complex series of factors including experience, perceptions, training, inner dispositions, and the participant's evolving definition of the construct of "sound assessment." Highly evolved practitioners seemed to follow a similar developmental pattern. Process-based forms of assessment were found to be incorporated more by those who understood and appreciated both their value and the many technical considerations necessary for their sound implementation. Implications for practice and professional development are offered.

Examining Practices and Perceptions related to the Soundness of Process-based Assessment by Experienced and Inexperienced Teachers

Introduction

This study examines practice and perception in the area of assessment. Given the increased prescription for, and use of, performance-based assessment, a better understanding of its costs and benefits is warranted. While the general purpose of assessing more authentic and "hands on" types of learning has been fairly well established (Branch, Grafelman & Hurelbrink, 1998; Fabry, Eisenbach, Curry & Golich, 1997; Jansen, 1995; Popham, 1997; Shindler, 1999; Stiggins, 1996; Wiggins, 1999), the various psychological, theoretical and practical outcomes related to the use of process-based forms of performance assessment are still as yet not well understood. The majority of the discussion related to performance assessment surrounds the its ability to produce reliable measures of performance (Burger, 1994; Crehan, 1998; Popham, 1997). While reliability is certainly critical to the *soundness* of any system of assessment, the value of any practice must be viewed within the full range of purposes, as well as the intended and unintended consequences of its use. Simply put, a sound form of assessment is one the achieves more and better results with learners. Within this lens of soundness, process-based forms of performance assessment could be characterized as having both a compelling up side and a problematic downside (Fabry, 1997; Popham, 1997, Shindler, 1999; Stiggins, 1996; Wiggins, 1999). Yet, while recognizing the troublesome aspects of this poorly understood and rarely and unevenly applied method of assessment, there seems to be powerful evidence that it can achieve some important desired outcomes better and more dramatically than other assessment methods (Branch, 1998; Jensen, 1995; Shindler, 1999; Stiggins, 1996).

In most cases, the author of, and to a significant degree the instrument of, most performance-based assessment is the teacher. The roles of perceptions and experience, therefore, become radically influential in how any assessment practice is ultimately carried out (Hannafin, 1999; Yang & Shindler, 1999). The sophistication required to effectively assess process outcomes in the classroom is lofty. The common sense perception does not seem to accurately reflect the reality of both function and benefit (Shindler, 1999). As Richard Stiggins (1993) writes, "(Process-based assessment) is a practice that has gone on for decades, but in many way has never really been tried." Because expertise in the practice of assessing complex processes requires both a theoretical understanding and a substantive period of praxis, its usage can not be fully taught. It is more art than recipe (Wiggins, 1999). Therefore the element of experience becomes an interesting feature in the development of a process assessment expert. What experience is valuable experience? How does experience lead to growth and sophistication of practice? While there is a substantive body of research dealing with the cognitive development of teachers (Fabry, Eisenbach, Curry & Golich, 1997; Fullan, 1993; Glickman, 1982; Harding, McLain & Anderson, 1999; Havighurst, 1980; Johnson, 1998), there is little understanding of why teachers evolve their practice in such

dramatically differing directions and rates. The road to becoming a "master assessor" is still very much a mystery.

This study examines the relationships between practice and perception related to the soundness of process-based forms of performance assessment, and explores the role of experience in teacher perceptions and pedagogical evolution in this area. The study was conducted in three phases. The early phases explored the perceptions of pre-teachers with the final phase examining both practice and perceptions of practicing teachers. Throughout the study the construct of *soundness* was used to frame the data collection and analysis. A qualitative quasi-emergent design led to the need to modify the study focus and to explore the dimension of practitioner evolution within the discussion of "what is sound practice?" The findings of the study suggest an interesting relationship between perception, inner orientation and experience and sound practice, and provide useful practical as well as theoretical implications for the field.

Theoretical Frameworks

Assessment Soundness

An assessment system would be considered *sound* to the extent it is characterized by the following qualities; high levels of validity, strong reliability, practical efficiency, and the production of positive effects on student learning and motivation (Stiggins 1996). These four factors making-up the construct of sound assessment are operationalized for the purposes of the study as follows. First, is the assessment practice valid? In other words, does the assessment method measure the most fundamental, relevant and essential learning outcomes, and are the consequences of the method desirable? Second, does the assessment method satisfy the necessary conditions of reliability? In other words, is it experienced as fair, is it free of bias, and could it achieve consistency used by multiple raters? Third, the system of assessment must be *efficient*. It must be conceived in a manner that is "doable" and does not take away from the instructor's ability to instruct. Fourth, the most commonly overlooked factor in the examination of assessment soundness is the affect the system has on the student as a learner and person. For the purposes of this study, this fourth factor will be characterized by measures of motivation, internal locus of control, sense of community, and self-efficacy, as well as achievement.

Process-Based Assessment

For the purposes of this study, *process-based* assessment is defined by the measurement of what could be considered the most fundamental processes, progressions and interactive outcomes within a learning environment. It is contrasted to either the emphasis on the evaluation of products or the use of indirect measures of achievement such as written tests. These outcomes seem to fall into three general areas. The first area would be defined by each student's overall growth. In this case, achievement would be viewed as a measure of gain in knowledge and skills from the beginning of the term to the end. The second area would be defined by each student's progress and incremental growth toward course assignments. In this case, the focus would be on both the quantity and the quality of the work completed by each student in the process of developing end products such as projects, presentations, major papers and labs. The third area would involve the student's application and contribution to the learning community. This domain would focus on

indicators of individual application to self-growth, quality interactions with classmates, and quality participation in assigned group projects.

Methodology

The study was conducted in three phases. First, a pilot study was conducted during spring 1999 to develop initial data and theoretical categories. Second, during summer 1999, data were collected related to the perceptions of pre-teachers. In the fall of 1999, practices of teachers were examined. In the initial phase, the research was conducted by a three member team from the Department of Curriculum and Instruction; the applied technology course instructor, another faculty with an assessment specialty, and a third faculty member with a specialty in K-12 applications. In the second phase and third phases, a graduate student taking the course was added as a participant researcher.

The pilot phase involved the development of a process-based system for evaluating student performance in an applied educational technology course. It incorporated sixteen student participants enlisted in one section of an applied Technology course. Eleven of the participants were graduate students currently teaching and five were pre-service teachers. Participants were given the definition of soundness (i.e., validity, reliability, effectiveness, and disposition/affect) and an orientation in the development of performance assessment scale development. Over the course of the semester students were consulted regarding both practical and theoretical considerations of developing such a system by the research team. Upon completion of the semester, a system for assessing process-based outcomes was collaboratively developed (see Appendix A) and a research design was developed for a second phase involving a hypothetical implementation of the system. The process-based condition that were ultimately used in phase II included scales related to 1) the student's effort and interaction and 2) their growth. A scale measuring progress was considered, but was never developed, due in part to the fact that the member of the team that developed the assessment scales was not entirely familiar with the practicalities of the assignments and tasks that were to be used in the course. The research team concluded that the system was still too experimental and a full-scale implementation was not as yet responsibly or ethically warranted. Therefore, the choice was made to gather data comparing students' judgements related to the hypothetical use of varying assessment systems as a substitute for creating actual differing conditions.

During phase II (summer, 1999), qualitative data were collected within the context of a "hypothetical implementation" of the process-based system. Participants include students from three sections (N=45) of an applied educational technology course comprising graduate students currently teaching (N= 17), graduate pre-service teachers (N= 14), and undergraduate pre-service teachers (N=14). The choice of design was influenced to a great extent by the participants' ability to contribute to both the theoretical as well as practical issues involved in the design of an assessment system. After an orientation to the system and some role playing activities to immerse the participants more experientially into the proposed system, the participants were surveyed to determine how they would hypothetically respond to being assessed within the 3 different conditions: process only, product only, and combination. The survey included scaled items measuring strength of participant attitudes related each system's soundness, fairness,

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motivational effects, appropriateness as a model at various educational levels, effects on teacher-students relations, and inter-student relations. A randomly selected sample of participants were chosen and interviewed in 2 to 4 person focus groups.

During phase III (fall, 1999 and spring 2000), qualitative data were collected from practicing teachers with regard to their usage and perceptions toward the assessment of process-based assessment. Voluntary surveys were given to the staff's at 2 large rural high schools. Thirty-five surveys were returned completed (about a 50% return rate). In addition, 12 purposively sampled participants were interviewed, including 4 from the members of each staff who did not return surveys. Interview participants were selected on the bases of the representation of the projected range of practices and perceptions. Survey and interview data were collected and coded within the analytical framework of soundness. Further iterations into data analysis precipitated an additional theoretical framework related to how teachers seem to learn and evolve their practice. This framework will be examined later in the paper.

Study Results

Phase I Findings: Initial Exploration

Early findings showed students reporting heterogeneous reactions to the idea of a process-based assessment condition, yet with several common themes. Students supported the idea of being assessed in terms of the quality of their contribution to the whole class almost unanimously. They felt that a fully successful student could not work in isolation of others. Most felt that the students who needed help had an obligation to seek that help. Conversely, the students who had a high degree of expertise had an obligation to assist others that could use their help. Students supported the idea that progress or gain should be measured. All students indicated that those who entered the class with little or no ability and make significant gains, regardless of their performance relative to the other class members, should receive grades that reflect that growth.

While most participants were conceptually agreeable to the process-based system, they had substantial concerns regarding its practical applications. One significant factor was that of trust. Students could not make strong commitment to a process-based system of assessment if they did not trust the assessor. Another problematic factor related to the question – would the teacher-student relationship change in such a system? Many participants felt that it might. While students supported the theoretical principle of measuring progress toward course assignments, they had concerns about the reliability of the rubric used to assess progress. Overall, students felt that a process-based system was worth pursuing, but needed to be refined, and would best be used in concert with product-based assessments.

Phase II Findings: Pre-teacher Perceptions

The formal results from the second phase of data collection confirmed much of what was expressed anecdotally in phase I. Data from the 37 of 45 returned surveys reflected support for the concept of a process-based system (see table A), but overall showed an overwhelming preference for a system combining both process- and product-based data usage. This support for a combined system of assessment could be seen in the following

written survey comments where participants were asked to state how they felt about an assessment system combining both process and product components:

> "The best of both worlds."
>
> "Obviously, the appropriate middle ground. Everyone wins with this. Student with strong technical skills and strong personal skills can benefit from this and learn something from each other at the same time. In the "real world" we need to try our best, work well with others and complete specific tasks at acceptable standards. The sooner all students K-graduate learn this the better."
>
> "This assessment measure allows the student to demonstrate strengths and weaknesses most effectively, this is the most fair manner of assessment, especially for a technology class."

Table A: Item means from survey data (N=37; 4 high agreement to 1 low agreement)

3. Judge the following assessment conditions in relation to how accurately each could capture how much a student puts into her/his learning.
Product only: 2.87
Process only: 3.16
Combination: 3.76

4. Using the following system, I would trust the instructor to reliably and fairly assess the quality of my work.
Product only: 3.14
Process only: 3.11
Combination: 3.68

5. The most essential learning outcomes in "this kind of class" could best be exemplified/represented/embodied by each of the following:
Product only: 3.11
Process only: 3.11
Combination: 3.81

6. Judge the following assessment approaches in relation to how appropriate each is, in your opinion, for a university level course in applied technology.
Product only: 3.27
Process only: 2.97
Combination: 3.70

7. Judge the following assessment approaches in relation to how appropriate each is, in your opinion, for a K-12 level lesson using technology.
Product only: 2.89
Process only: 3.11
Combination: 3.68

8. Judge the following assessment approaches in relation to how you feel each would affect teacher-student relations.
Product only: 2.8
Process only: 3.08
Combination: 3.68

9. Judge the following assessment approaches in relation to how you feel each would affect student-student relations.
Product only: 2.62
Process only: 3.19
Combination: 3.46

10. Judge the following assessment approaches in relation to how each would influence your inclination to be cooperative and/or your sense of responsibility to work with others.
Product only: 2.87
Process only: 3.40
Combination: 3.57

11. Judge the following assessment approaches in relation to how each would influence your level of motivation to put forth your best effort.
Product only: 3.2
Process only: 3.47
Combination: 3.73

12. Judge each of the following assessment approaches in term your estimation of how fair they are to the full range of ability levels of students in the class.
Product only: 2.65
Process only: 2.97
Combination: 3.54

13. Judge each of the following assessment approaches in term of your estimation of their ability to be carried out efficiently.
Product only: 3.43
Process only: 2.81
Combination: 3.43

14. Judge each of the following assessment approaches in term how well they provided an opportunity for self-growth as a reflective educator and critical user of technology.
Product only: 2.94
Process only: 3.35
Combination: 3.73

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The survey data shows both an aggregate preference for a system using a combination of process and product based components and a mild overall support for the idea of a process-based approach. Participants did feel that the process approach may be more appropriate for a younger age student group shown in the preference on item 6 for a more product-based approach and item 7 for a process-based approach, however this preference was not demonstrated in other items related to the validity of each condition. As was expected, given the phase I data, participants rated the process-based condition high in the area of validity, moderate in reliability, moderate to low in efficiency, and very positive in the its affect on students. However, as can been seen in items #6 and 7, participants as a whole felt that process-only assessment was probably most appropriately applied to the K-12 level (x=3.1), and slightly less appropriate at the university level (x=3.0). Yet they felt that some combination should be employed at both levels (x=3.7).

While the overall data showed something of a "mistrust" by students of an assessment system using entirely product or process-based techniques alone. There was interesting variability between groups. Males, graduate students, and those reporting to have spent "a great deal of thought" considering the three conditions tended to be report more positive responses to the process-based condition in general. This could be seen in the means for the process-based option in item #3. The overall mean was 3.16. Males (N=10) scored it 3.5, graduate students (N=26) 3.3, and high time investment students (N=6) 3.6, while female undergraduates (N=10) scored it at 3.0. With much of the gender difference explained by the fact that 10 of 11 of the undergraduates in the sample were female, these results point to a possible relationship betwe[illegible]pport for and comfort with the use of a process-based assessment and a prac[illegible]derstanding of how it could be applied. Graduate students in many cases had take[illegible] formal course on assessment whereas undergraduates had not.

Validity

Overall the participants felt that a combination of process and product assessment would be the most valid way to represent their achievement. However, there was some between-group variance. This variance could be seen best in items related to the validity of the 3 conditions (#3,5 and 12). The group (N=6) reporting that they spent "a great deal of time" thinking about the different conditions showed significantly higher approval on all 3 items related to the validity of the process-based condition (mean group scores of 3.3 compared to overall mean of 3.0.

Overall, participants felt that the most valid way to capture student achievement was with a combination of both process and product-based measures (process only 3.1, product only 2.8 and combination 3.7: means for validity item). The following written comments illustrate this general sense:

> "I believe a combination would best suit the grading objectives for this course. A process rubric should be included in the course syllables with grading explanation allowing students to understand what is being asked of them."
>
> "This is a tricky one; some students can fly by with little effort and make a great final product; vice-versa sometimes a lot of effort is put into something and the final product is not what it was hoped to be; a combination is better than either alone."

Reliability

Overall participants felt that a combination of assessments would produce a more reliable measure of what a student was capable of and had accomplished than either condition in and of itself. Males were a little more trusting than females (3.4 to 3.0) of an instructor's ability to accurately assess the process. There was a general concern that one could not see process, shown in the following comments:

> "With product-based there is final outcome to assess. With process, there is no way an instructor is going to observe every individual at all times."
>
> "How could he know how much I knew before?"
>
> "Process-based only assessment would be very time consuming on the part of the instructor. In a large class daily observations may end up being made hastily."
>
> "This however is completely dependent on the instructor. The instructor must be completely familiar with the grading style and willing to use it."

While there was a general sense that process only assessment had dangers, many of the more experienced educators in the group felt that it was possible. And while they felt that a combination of assessment measures would improve reliability, they felt that if one chose to commit to a system of process-based it could be successfully as long as it had a well designed system and had "very clear benchmarks."

Efficiency

Overall the participants felt that an assessment system based on tangible products could be executed more efficiently than one involved an attempt at assessing process. But there were again voices that felt, while it was inherently difficult to efficiently assess, it was somehow the duty of the instructor to find a way to do it. As one participant put it, "It will take more effort on the part of the instructor but it will be a more valid form of assessment."

Affect on Students

On items related to each of the condition's affect on the student and class (#8,9,10,11 and 14), a combination was still felt to be the best, while participants felt that a process-based system would be much more beneficial than that of a product-only condition.

The positive feeling toward the qualities of a process-based system was again even stronger here for males and those identified at the secondary level. For item #9 related to how each condition would affect student to student relations, secondary participants (N=15) reported a 3.6 mean for the process-based system. On item #11 related to how much each condition would contribute to one's feeling of motivation males (N=10) reported a mean of 3.7.

Participants' responses supported the notion that outcomes are inherently student-controlled within a process-based condition, and therefore within the internal locus of students themselves, making it more motivational. Also they felt that assessing student interaction would contribute to the quantity and quality of student interactions. Many

participants expressed the attitude that even if this were not a class filled with educators, there is a need for college courses to put some meaningful assessment on the quality of interaction. These interview participants, most of whom were graduate students, felt that the system of assessment used in any course should promote the most important and desirable outcomes possible. It was felt that without some aspect of assessment that reinforced the importance of inter-student responsibility, it would not only reduce the frequency of collaboration, it would essentially make the epistemological statement that it was not important.

Participants reported mixed feelings about the self-report rating scale for ability growth. They felt it was promising but problematic. Interview participants reported a very positive attitude toward the use of a self-reflective assessment component. For the most part, these participants expressed the sense that it could be a valid way to represent growth and a useful meta-cognitive tool to encourage self-reflection. Survey comments seemed to be more uneven. The feeling that "other students" would fudge their entering level to inflate their end level gain was mentioned. The more experienced students thought that the reliability issue could be reduced to an insignificant level and that the benefits of a self-reflective component were well worth the effort to include it.

Overall Feelings

While participants were generally positive about some combination, they reported mixed feelings about each of the pure conditions. When asked how they felt about a product only condition they were hesitant to endorse it because of its apparent inability to see effort or take into account different levels of ability. This hesitation could be seen in the following written comments:

> "Sometimes you need this. It doesn't show how much you h . . e moved. What about slow learners that have accomplished tremendous ounts, but not made the project?"
>
> "This is fair to those students that can produce a great product. But for those that put in a great deal of effort and their product is not the best then they lose out."
>
> "I believe an instructor should never base a final assessment on the results of a final product only."
>
> "Does not take into account the varying levels of ability. Also does not account for the effort involved."

However for some students especially those who reported a high degree of competency, a product-based condition suited them well, shown in the following written comments:

> "I am happy with a products only assessment because I am good with computers."
>
> "For an excellent student this would be most beneficial. For those students needing help, you can't truly see how much that person has learned in products only."

"My preferred method. Set the desired goals those that reach them are ok. Those that process the knowledge prior to taking the class should move straight to a more advanced class."

"This means of evaluation is better than process-based because one can see how much time has been put into a product by the way it looks in the end. Alone though one cannot see the full picture and a student may be missing out on credit for the effort that was put into it."

As stated earlier, the response to a process-based system varied depending on the area of soundness that was being measured. Especially in cases of undergraduate participants who had not taken a formal assessment course and did not feel comfortable with a practical way of constructing a process-based system, there was a great deal of hesitancy related to issues of reliability and logistics, shown in the following written comments:

"I wouldn't mind being graded on my interaction and effort, but I wouldn't want to be graded solely this way."

"Very subjective."

"My personal favorite. Need clear benchmarks though. Without it it's useless."

"This gets a little sticky. Questions come up like what exactly is a "written defense" or the definition of "clear indication." Also- self-assessment is difficult- will anyone say they haven't experienced growth? Effort, initiative and collaboration are important for us all, but cannot be the only basis of evaluation. I also have concerns as to how reliable this assessment is on it's own."

"This form of evaluation, I believe is impossible. By saying impossible I mean that a teacher observes him/her at the wrong time. This means evaluation would be more worthwhile if there was more than one or 2 people who were observing."

However, while many felt the practicalities of the process-based condition were problematic, it was seen as a way to motivate and measure varying levels of ability

"I like this method because the effort part. Computers don't come naturally to everyone, but everyone can try and work harder to get better."

"I always include an effort and/or participation grade for final assessment. But a shy student should be punished for not always participating, however."

"Students sometimes don't work hard enough or try to grow enough so they would need a rubric for this."

"I think this encourages students but they should hold some responsibility for the final product."

"This method . . . includes important assessment of the process student use."

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Phase III Findings: Practice and Perceptions of Practicing Teachers

In contrast to the pre-teacher participants in phase II, participants in phase III were currently teaching. This contrast could be seen in what could be characterized as a less idealistic set of perceptions toward the notion of good assessment, in most cases. These participants could be considered, "in the trenches." Moreover, while the setting in phase II was an applied technology context, the participants in phase III taught a variety of subjects. Overall, these participants reported a wide range of practices and perceptions. In most cases, they had never taken a formal assessment course so their attitudes and knowledge in the area of assessment had come from experience or as a response to state regulations and policy mandates. It must be noted that the state in which these participants taught is heavily regulated and currently employs a state testing framework that severely restricts their autonomy and capacity to choose what they teach.

While the interaction of experience and practice will be explored more later, the attitudes and assessment choices of these participants demonstrated a wide variation in terms of how one's years of experience affected one's beliefs and practice. As will be seen in the following data, some participants had not explored issues of sound assessment to any great extent and consequently had not evolved their practice significantly, while others had both explored and evolved. For these, the lessons learned from a continuous process of trial, examination and then modification provided the study with a well-grounded exploration of assessment theory into practice. This phase III data is again displayed within the four dimensions of assessment soundness.

Validity:
The level of teaching experience was not a consistent factor in the perceptions of teachers toward the validity of assigning hands on work or assessing the quality of the process of student work. Very experienced teachers reported very different attitudes about what constituted a valid way to view student learning. This contrast can be seen in the following interview passages:

> "Most of the regents (standardized) exams are perfectly valid tests of content knowledge and understanding. Everything I do is to prepare for that day. I have too much material to cover by June to waste time with inquiry activities. If I used inquiry like the new standards suggest, I could do maybe half the course in one year." (Science Teacher, 26 years experience)

> "I no longer use true false, multiple choice, or fill-in the blank tests. Information to be put into short-term memory for such tests and quizzes is as quickly forgotten and does not measure competence in performance. It simply reflects some "factoid" memorization . . . Basically, I do not care that the student knows isolated facts out of context. Show me knowledge actually doing something. A classroom should not be confused with a quiz show!" (English Teacher, 23 years experience)

Many teachers struggled to find ways to teach and assess more authentically. Given the state testing structure and the high stakes nature of the "standards," many felt that they would be doing more authentic assessment and inquiry based learning, but felt that they

had to attend to covering the material so as to prepare students for the (high stakes) test. This tension between what teachers wanted to do and what they felt they had to do was reflected in this quote from an earth science teacher with 3 years experience:

> "I have been struggling with valid assessment, I feel as though I could be doing a better job but I have no models of better procedures that fit the level and content that I teach. I usually avoid projects and presentations because I am nervous about how I will assess the project in a way that is fair. I know that there are different ability levels and I want to assess each student based on what they are capable of. Also, it does take considerable time to teach everything that is in the curriculum, If the project does not teach as much in the allotted time as my current method I feel I'm cheating the class, especially the weaker students."

Many participants dismissed the idea of process assessment altogether, while some felt that no matter what the "ideal practice" would be, accepting that in some "perfect universe" that there was some validity to the idea of assessing more of the process related outcomes in their course, they just could not make the investment of time and/or curriculum reform. Other participants felt that this investment was worth it. One experienced art teacher suggested that it was her job to teach to the needs of the whole student including the students' problem solving skills. She felt that without the ability to assess the process students used to arrive at the end product, she could not teach problem solving adequately. This sentiment was shared by an experienced science teacher. He felt that the quality of the work and reflection that he got from students during his lab activities was better if he assessed the quality of the process demonstrated in their write-ups.

Many of the graduate student-participants in the phase II study data expressed the attitude held by a physical education teacher of 25 years, that is, assessing the quality of the manner in which students interact is an essential and fundamental outcome that they felt a responsibility to promote. In the mind of the PE teacher, cooperation skills were as important as anything he taught, so he felt the necessity to develop a way to measure them. He made the assertion that, "What [a teacher] assesses they define as important. How can you really say it is important if you do not grade it?"

Certainly grade level and subject matter taught must be factored into any teacher's pedagogical development. Different courses have different types of content. However, there is enough variability within any subject area to support the notion that any teacher in any subject could make the legitimate choice to use more or less authentic assessment. So while PE and art are typically viewed outside of the basic subjects it is worthwhile to examine the similar evolutionary paths of the aforementioned art and PE teacher, to better understand how they came to their current attitudes and believes related to the validity of process assessment. Each began teaching without any formal assessment training. Each began using very traditional methods for the 1970's, yet both transformed their practice dramatically over the course of the years and job transitions. Each seemed to find a period a few years into their careers where they asked themselves the question, "What are the most essential learnings in this course and how can my assessment achieve more of them?"

The PE teacher expressed an interesting belief related to the relationship between assessment and outcome in the following statement:

> "If I assess process and participation, the products and the skills take care of themselves. People watch my class and they see the skill level that is many levels higher than what they have seen in other programs, and they are really surprised when they see that I only assess the quality of students put into it and often nothing related to how well they do."

The art teacher when asked if she felt that assessing process insured a quality product, replied:

> "Yes, about 90% of the time. There are exceptions where students are learning disabled or so gifted that they can sluff around at the beginning of the unit and then just manufacture an excellent product, but most of the time that is true."

Reliability

With regard to the reliability of assessment practices there was an array of outlooks that were discovered. The progression of complexity is as follows:

> "'Traditional' teachers', those with practices consistent with assessment strategies popular in the sixties and seventies, hold a view that reliability is derived from standardized tests. By modeling the classroom assessment after the standardized regents examination they feel that their assessment is inherently reliable. "If you make sure that the students know exactly what they have to do, then all they have to do is do it. If they do as they are instructed they will pass."

There was a different view taken by novice teachers. It was apparent that they had been instructed in various 'modern' assessment strategies but lacked the experience necessary to implement and experiment with them. Lack of in-depth understanding in the fundamental structure of many assessments appears to lead to a feeling that the assessment was inadequate. This feeling was expressed well here by a new history teacher.

> "Rubrics are too lenient and are frustrating for students who are used to concrete grading. It also gives too much help to unsuccessful kids."

Among veteran teachers who had the opportunity and desire to experiment there were various results but an apparently common theme. There was a view that to be reliable there must be concrete written proof of all work for purposes of accountability. "I assess lab work write-ups. I find that they see it as pretty fair. It is all written and straight forward." With this came a desire to avoid subjectivity. "I have decided not to assess participation, I just feel like it is too subjective. I thought about it, but decided not to try it." "I don't like subjectivity. I need to feel like my (assessment) processes are fair and reliable, and I think they are, because I needed to make them that way."

This desire for making the abstract concrete was at the heart of what most effective teachers are trying to do. Even the traditional teachers feel this but they avoid subjective

assignments all together, rather then confront subjectivity with a concrete strategy for objective assessment.

These teachers commonly feel the need to make subjective work and projects as concrete as possible, in an effort to promote the experience of "fairness" by students. However one teacher felt that too much prescription of the process inhibited creativity, shown in the following sentiment:

> "You need to look at what the students can ultimately do since process is almost impossible to measure and observe accurately. A worrying involvement with rigid process mostly reflects teacher insecurity."

One experienced Art Teacher viewed her assessment within the notion of performance reliability. For her a reliable assessment of what a student was capable of required multiple assessments and multiple trials. For her not all students could show their ability without having the opportunity to show their process and feel that that process was being valued. She stated:

> "To get a reliable assessment of what a student can do, you need to find out what they can do. Some students have problems coming up with original ideas, so to penalize them for that inability would be unfair."

The majority of teachers felt that the product was the key to their growth and that by assessing the product one was automatically assessing the process. If the product was high quality then the process used must also have been high quality as well. In contrast to this belief was the PE teacher who had been assessing process for years and found that if one assessed the process the product took care of itself. While he finds that people are skeptical of his methods, they can not believe that he has a reliable way to obtain participation assessment. He explains what he finds this way:

> "I use process assessment of student participation and skill. I think it is really reliable. Sometimes I will ask my TA to do the assessment and they obtain almost exactly the same scores that I would have. I think students see their participation marks very clearly, they accept them as legitimate. Often I have parents come to me saying angrily that they can not understand how I could have given their son or daughter 2's of 3's every day for participation, so I explain my system to them and give them concrete examples of what the student does in class, and they usually walk away saying' hey that makes sense, and you know, that is just how he or she acts at home'"

Efficiency

While many of the issues related to efficiency were apparent to the pre-service teachers reporting in phase II, these issues were perhaps the paramount reality for a practicing teacher. For this reason most teachers base their pedagogical choices on the apparent feasibility, and process assessment within the context of "authentic learning," inquiry-based, or "hands on" types of instruction appears to be very labor intensive. The pressures resulting from a lack of time and high stakes testing structure can be seen in the following passage from an earth science teacher with 3 years experience:

> "When dealing with regents course work, every lesson needs to be designed to convey the best understanding in the shortest time possible. Perhaps it is this race against the clock or calendar that inhibits many teachers desire to experiment (I did it this way, they got the info they passed the test and we still had two weeks to review at the end of the year therefore I did a good job and nothing needs to change)."

Most participants surveyed in phase III reported no effort to use process-based or context-based assessment. However there were many lessons learned from those who did make the commitment. Many of the English teachers and one science teacher found that using written evidence of process was more efficient than some form of observation. They felt that students still paid attention to their process (i.e., editing, revisions, and lab write-ups), and experienced the process assessment as "pretty objective."

Those who made a commitment to assessing participation on a regular basis typically reported that, "yes, it takes more work and time, but it is worth it." One such case was that of the experienced art teacher, who stated, "It is a lot more work to do this." But she went on to suggest that the time spent assessing had the hidden cost benefit of saving, "a lot less time establishing the certain attitudes, and orientations and with classroom management."

The aforementioned experienced PE teacher found a similar trade-off. In the following passage he explains the paradox of investing more attention into assessing the process.

> "Sometimes I feel like I am spending a great deal of time with my clip board in hand walking around and making notes and marks. So much so that I am missing opportunities to make contact with kids. But what I see is that when they are able to see their marks and use that information to get better, first they have a clear sense of how they are doing in the class, and second, they can see what exactly they need to work on and what it takes to succeed. It does take me away from students some days, but I just like the results too much."

Affect

An important yet under-recognized result of assessment is its effect on student affect. Often a student's motivation is influenced by their perception of whether or not their efforts are being judged fairly. While few pre-teachers had a good grasp of this connection, many of the practicing teachers did. However, as with most perceptions there was a great deal of variety in the views of the experienced teachers in this area.

When asked how one's assessment methods affected student-student relations, or teacher to student relation, over half of the participant teachers responded that in so many words, "It had no effect." This response was common among those who did not return surveys and those who did not see much if any value in assigning work that involved inquiry, hands on exploration, or product oriented outcomes. In contrast, teachers who incorporated more hands on and cooperative work typically saw a significant relationship between how one assessed and its effects.

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The teachers who considered themselves 'traditional' typically felt that making the students 'happy' was not part of their job description. This was expressed here by a math teacher with 18 years experience:

> "It's not my job to motivate students. They have a job to do and if they don't do it they fail. Every student has the right to fail. I don't really care if the students like the class, if they do that's great but if they don't they still have to do the work so what's the difference?"

Some novice teachers used process assessment as a behavior modification tool. In one case a new teacher described his practice this way, "Students who do not work well in class will lose their participat~~ion~~ grade. This will reinforce positive behavior." It could be inferred that he equated assessing process with tacit negative reinforcement.

Teachers who experimented with various techniques found that there was a simple relationship, "If you assess it, you get more of it. (Students) get more satisfaction and respect for the process ultimately and they do not without it." A science teacher with 20 years of experience found that students just worked harder when he began to assess lab work write-ups. He tried using just exams, but has gone to assessing the quality of the lab process by evaluating the evidence of lab work in a formal write-up. He did this because as he said, "I just didn't get the effort level with just tests. I think over time students have just gotten lazier and they need to be motivated these days." He went on to suggest that since he teaches advanced, very self-motivated students, he stops short of other forms of process assessment, but felt that if he was teaching a younger or less motivated group he might consider other types of assessment as well. He likes assessing just written work and refraining from anything that was too subjective, because he felt the students saw it as fair, and he did not have to deal with students putting on a show when he came around to grade their lab participation. As he put it, "Since things are all on paper there is no problem with authenticity."

This relationship between wanting to guide the process by assessment and over-prescribing thus promoting some degree of inauthenticity had been fully explored by this 23-year English teacher. He warned that, "If students write to please their teacher then you've done them a disservice. Students know when they are being judged as mere memorization machines and resent the implications that that is all they can or should do."

It seemed that the teachers that demonstrated high degrees of practice evolution and chose to assess process seemed to do so because of what they found in terms of student learning and growth, and had little to do with a theoretical belief in any methodolgy. This sentiment was reflected well in the practice of the experienced art teacher. She felt that because she wanted all her students to succeed, and have faith in their own work, she found the assessing process and helping students care about their process helped her get the most out of them. She says that,

> "If students are asked to care about their process they are less apt to look at others work for the way to do it. Assessing process validates their own thinking and ultimately their own product."

Maybe the simplest relationship that some teachers found between assessment and student affect was expressed by the aforementioned experienced PE Teacher. He found that assessment helped him tangibly reinforce what he thought was important. He says,

> " If I assess listening I get better listening. If I assess effort, I get better levels of effort. I cannot understand the teachers who complain that their students do not listen, do not try, or treat each other (poorly). Assessment teaches students what is important, and I want my students to be cooperative. So I assess it and they are – which is amazing to some people."

Conclusions

Soundness as an A Priori Conception

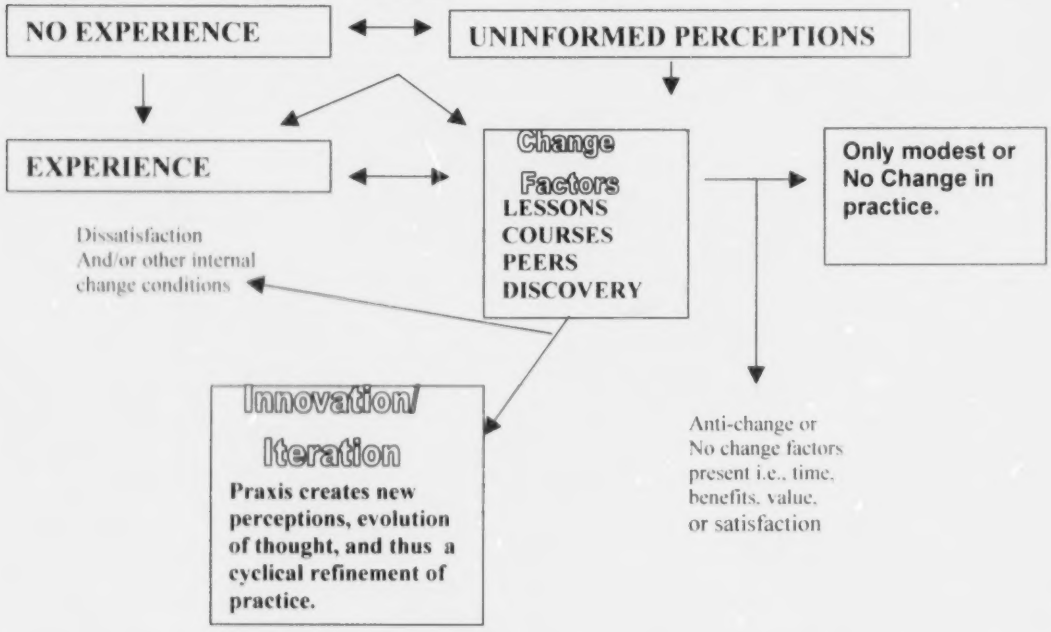
Given the wide variation in practice and the equally wide variation in perceptions toward assessment reported by the participants in phase III, explaining teaching evolution simply as a function of years of experience, or as a homogeneously held desire to find the most sound practice, does not seem to fit the data. Likewise, to suggest that all teachers were attempting to achieve the same outcomes would seem unsupportable. Or, to suggest that all teachers used some conception of "sound practice" as their guiding value appears no to be the case. Hence in effect, participants are being compared across dimensions that they have varying degrees of awareness of and/or value for. It appears that the participants who are comfortable with the practice and underlying values of a lecture and test methodology, are not using a definition of soundness that is comparable the one used in the study. In fact it could be inferred that their paramount value has more to do with expediency and routine than with any compelling desire to attain ideal levels of what could be characterized as soundness. Our finding is that an *a priori* definition of soundness did not exist, for whatever reason, in the minds of many participants.

For the participants that adopted practice that could be considered sound within the definition of the study, a common set of factors seemed to exist. The initial criteria for this evolution of practice seems to be some paradigm of thinking that includes a definition of soundness or a desire to reflect upon a definition of soundness. While the sample was relatively small, there seemed to also exist the need to justify or legitimize one's professional value. So given the need to prove oneself, a propensity toward creating an ideal, and the opportunity to test and adopt over time, the result seems to be the movement toward sound practice. Moreover, it appears to be the case that when a teacher uses a practice that is sound, it is inherently evident and as a result rewarding.

Experience as a Factor in Growth

Data from the phase III of the study suggests that experience as a variable in the process can have varying affects on participant's development as a teacher. This supports earlier research that not all experience leads to changes in practice or even to insight (Hannafin, 1999; Johnson, 1998; Yang & Shindler, 1999). It could be inferred that participants interpreted their experience differently. Figure A below depicts this learning process sequence.

Figure A: Teacher Experience Model


NO EXPERIENCE
UNINFORMED PERCEPTIONS
EXPERIENCE
Change Factors
LESSONS
COURSES
PEERS
DISCOVERY
Only modest or No Change in practice.
Dissatisfaction And/or other internal change conditions
Anti-change or No change factors present i.e., time, benefits, value, or satisfaction
Innovation/ Iteration
Praxis creates new perceptions, evolution of thought, and thus a cyclical refinement of practice.

The model above seems to help explain the question raised by the data, "why do some teachers evolve in their practice and perception as a result of experience and others seem to remain somewhat static?" As this model suggests, courses, peers, and first hand experience do not seem to be sufficient causal agents for change. It would be difficult to imagine a teacher evolving their practice significantly in an idea vacuum, but environmental factors alone do not seems to explain growth. As many studies of teachers seem to suggest (Fullan, 1993; Glickman, 1992), a trait of dissatisfaction seems to be required to motivate growth. While sound practice does not exist in an absolute sense, there are certainly realities associated with any practice. It could be suggested that to be a fully effective teacher one needs to be aware of those realities and/or costs and benefits of any practice, so that one can make choices that are consistent with the outcomes one most desires. The study participants that could be said to have evolved their practice most significantly in the area of assessment appeared to experience some combination of exposure to outside ideas, opportunity, capacity, a sense of dissatisfaction with their teaching, and the use of experience as iterations in a growth cycle.

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The two subjects that best illustrated these conditions were the art teacher and the PE teacher. Both had had a series of new assignments that provided opportunities for fresh starts and new approaches. Both spoke of feeling like the legitimacy of their subject area was continually questioned and so they felt like they needed to perform at the most effective levels using the most "defensible" practices. And both shared an inner quality that caused them to be continually dissatisfied with their practice and compelled them to test and retest new ideas.

Soundness as a Valid Construct

The construct of soundness seems to hold up well empirically. That is, teachers who had the intention and motivation to attain a set of practices that were "most effective" and most justifiable, and had significant exposures and iterations "doing it" seemed to find a similar theoretical location. Therefore, given that independent explorations into the realm of discovery led participants to a like construct, in this case assessment soundness, the construct would seem to possess substantive validity. In this study, it appeared that the more participants knew, and the more they strove, the more they seemed to reach for making their practice consistent with this hypothetical construct of soundness.

Judging the Soundness of Process-Based Assessment

The seeming tension between efficiency and validity was apparent throughout the study. As was accurately foreshadowed in the perceptions of the pre-teachers, for the practicing teachers who made the commitment to using some degree of process assessment, issues of time and effort were ever-present concerns. In the minds of some, this apparent trade-off between the "ideal assessment" and "making it through the day" was mitigated to some degree by a corresponding decrease in the investment necessary with classroom management and instructional clarification.

Pre-teachers raised the interesting concern that if students were being assessed on some dimension of effort or application, that they would have an incentive to "pretend" to be applying themselves, and further, they would have an incentive to relate to the teacher in a manner that would ultimately garner them the best grade. The teachers who chose to use some form of process assessment seemed to feel that this was a only a minor concern, in part because they had each developed features in their systems to address the problem. It seems that authenticity is required to perform successfully in most learning activities, so "snowing" the teacher would not be a sufficient strategy to achieve success. This is especially true if, as was predicted by the pre-teachers, the overall definition of achievement included an assessment of the quality the end product as well as the process.

There were beliefs among both pre-teachers and practicing teachers that a process-based component to an assessment system was both too cumbersome and too subjective. Yet, this perception was not found in those who had developed a deeper understanding of the possible applications or had made more than a token attempt to implement it. The participants in the pre-teacher sample had a substantially different attitude toward what could be "objectively" and reliably assessed after they had a full course in assessment. In most cases, the practicalities of designing and implementing complex forms of assessment were not a deterrent to those who had been trained in the technique.

Likewise, we did not find any teachers who had previously used a great deal of authentic assessment and/or process-based assessment and had abandoned it due to a problem with subjectivity. There were some that modified their practice to attain more objectivity, but once participants began to seriously use more authentic forms of assessment they stayed committed to its use for the duration of their careers.

Both the System and Instrument of Assessment were Critical to Soundness

A final conclusion that seemed less apparent at the beginning of the study is that of the strong relationship between the system and the instrument of assessment. This linkage was apparent to pre-teacher participants who had spent sufficient time thinking about being assessed in more affective and potentially intrusive areas, and pondered the thought of having to decide what they felt justified in assessing in their future classes. The "who" was in many cases more important in their thinking than the "what" the assessor would employ. This concern was often related to trust and reliability for the pre-teachers. In the examination of the practicing teachers this relationship between the teacher as instrument and their system of assessment, presented itself more as akin to the artist and their medium. The ultimate quality of any piece of art is the result of a radically interdependent marriage of the artist and the materials. No set of materials can become art by themselves, while no artist's work would be fundamentally the same if it were done in a different medium. Like quality art, soundness, or the lack thereof, may be as much a result of the assessment artist as the choice of method.

Implications for Practice and Professional Development

1. **Process-based forms of performance assessment *can* be implemented soundly, if design, training and delivery are done well, but can also be ineffective or even harmful if delivered poorly**. An appropriate analogy for the use of process assessment could be the use of chemical medications. They have powerful effects, but have specific uses, and very often harmful side effects. Therefore, those training teachers in their use should be careful not to be irresponsible with their prescriptions for use. No treatment may be better than the wrong treatment.
2. **The use of some criteria for soundness in the evaluation (and self-evaluation) process of teacher assessment practices would seem useful.** If teachers were to internalize a definition of soundness they used as a guiding principle, their on-going concept attainment for "good practice" could be aimed more purposefully toward results with students, and would be less characterized by a default series of expedient practices. It can be assumed that all practice is done in the name of some "good," helping teachers clarify there definition of their respective "goods" may have a significant affect on their ultimate practice.
3. **Professional development in areas of complex pedagogical praxis that require a continuous cycle of innovations and modifications, as is the case with process-based performance assessment, require a correspondingly sophisticated approach.** Simply presenting a concept, explaining a skill, or indoctrinating students into a set of beliefs will not ensure a critical, evolving pedagogist. Teachers need both a way to seek growth (i.e., training, ideas, and resources), and a process to reflect and

collaborate on applying newfound awareness. We can not fault teachers who have not been exposed to quality ideas. We can not fault novice teachers for an unsophisticated application of a difficult skill. We really can not fault a teacher who works in isolation because they settle into a comfortable yet uncritical routine. If we want to cultivate "master teachers" we need to provide life-long learning opportunities for teachers, and treat teaching as what it truly is – an exceedingly difficult and complicated profession that requires a lifetime to learn.

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Appendix A:

Applied Technology Process Assessment Procedure

Part I: Student Participation Assessment (by instructor)

	Effort On-task	Self-Directed	Collaboration
Exceptional 4	Student has a clear sense of the task. Student. Time on task reflects full commitment to learning. Looks beyond task completion to ways to grow in skill acquisition. Communication with others is primarily related to the work of the class.	Shows a sense of initiative and responsibility in his/her learning. Does not need to be motivated or reminded to work. Asks questions. Finds creative ways to solve problems. Works outside class when possible or required.	Readily helps others. Initiates help when needed. Demonstrates a sense of responsibility to the growth of others. Expresses an interest in collaborating.
Successful 3	Student has a clear sense of the task. Student. Time on task reflects an effort to learn. Communication with others is primarily related to the work of the class.	Shows a sense of responsibility in his/her learning. Does not need to be reminded to work. Asks questions. Finds ways to solve problems. Works outside class when required.	Readily helps others. Gets help from others when needed. Expresses an interest in collaborating.
Good 2	Time on task reflects an effort to learn. Communication with others is not disruptive to learning.	Shows a sense of responsibility in his/her learning. Asks questions. Finds ways to solve problems.	Expresses an interest in collaborating.
Minimal 1	Time on task reflects some effort to learn	Asks questions. Finds ways to solve problems.	Does not inhibit the progress of others

After many class periods, students will be assessed as to the quality of their participation by the instructor. No less than 5 participation grades will be recorded. Each student's participation grades can be examined by that student at any time. Participation defined by this scale will account for X (see research options) of the overall course grade. The following scale will be used to translate daily participation scores into semester grades:

A = 3.7 or above

A- = 3.5 to 3.6

B+ = 3.2 to 3.4

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Part II:
Student Self-Assessment of Ability Level Growth:

At the beginning of the term each student will evaluate and then justify a self-assessment of their ability into one of the following five stages of technological ability. At the completion of the term each student will again evaluate their skill level and make a written defense as to their level of progress in the course. This written defense will be taken into consideration by the instructor who will make a determination as the degree of progress each student has made.

The following scale will be used to translate progress into grades.

A= at least one growth level, and a clear indication that maximum progress was made.

A-= at least one growth level and a clear indication that significant growth was made.

B+= nearly one growth level and a clear indication of significant growth.

B= some growth was made.

Which level of technological capability best describes you at this time?	
Novice Level 1	This level of capability is defined by a very low level of experience and skill. At this level the student only knows the most basal terminology. S/he has never produced a multimedia presentation. S/he has only done minimal word processing. S/he has only used the internet but do not know much about how it works. S/he considers her/his self a beginner and at least a little techno-phobic.
Fledgling Level 2	This level of capability is defined by the ability to use some of the basic software applications, but a very limited amount of experience. This person can work independently but has little knowledge of the software capability. At this level the student is not necessarily intimidated by computers, but s/he does not have one at home or in the classroom, or does not use it more than once a week.
Self-Directed Level 3	This level of capability is defined by the ability to work independently and solve most of one's own problems. The student at this level does not consider her/his self advanced, but s/he learns fairly quickly and mostly just needs more experience with the capabilities of the various software applications. S/he is willing and able to help others with simple problems.
Advanced User Level 4	This level of capability is defined by the ability come up with original ideas, solutions and approaches to tasks or problems. The student at this level has a firm grasp of both the assigned task and the capability of the computer's tools. They are willing and able to assist others with the most difficult problems. They often find information, resources, and software capabilities that assist both their own efforts as well as the efforts of others.
Mastery Level 5	This level of capability is defined by the ability to teach others. It assumes all of the abilities in level 4, but requires the student to produce work that benefits the whole class. This could take the form of teaching a lesson, helping the instructor find new ways to deliver the course content, being used as a model, or developing technology at one's work site that is original and of interest to the rest of the class.

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Comparing Assessment Conditions in terms of Their Soundness

You are being asked to be both participant and researcher in this study of differing assessment conditions. You are being asked to report which condition you feel is the most sound. Please examine the description of the three conditions and the definition of soundness below. You are encouraged to ask clarifying questions and discuss these issue with the researchers and each other.

Comparing Three Assessment Conditions:

A: Process-based only: This assessment condition entails the use of the two process-based scales that have been provided to you and described in class. In this condition, only the quality of your participation, effort, application, progress, and self-assessment of growth is used to determine your achievement and ultimately your grade for the course.

B: Product-based only: This assessment condition entails essentially the procedure outlined in the class (SOE 345/545) currently. In this condition, course projects are assessed with well-established criteria. All products are assessed relative to criteria/rubrics. Effort, progress, growth, quality of participation are not factored in to your grade in any form.

C: 50% Product/50% Process Combination: This assessment condition combines elements from the two exclusive conditions outlined above. The two process scales as well as scales assessing one or more course products would be used.

Working Definition of Assessment Soundness:

Validity:

- Assessment measures what it intends to measure
- Assessment measures the most relevant learning from course/assignment content
- Assessment method is well matched to the assessment target

Reliability:

- Assessment device could be used reliably by two different individuals
- Assessment device could be used reliably for repeated trials/performances
- An appropriate sample of performances is collected to represent a true representation of performance/ability
- Performance criteria is described in measurable, specific, concrete, objective outcome terms

Efficiency:

- Assessment data can be collected in an efficient, timely, doable manner
- Assessment does not unnecessarily interfere with teaching or learning tasks

Influence on Student Affect:

- Assessment procedure has an overall positive affect on the *student-teacher relationship*
- Assessment has an overall positive affect on the student's *motivation* level
- Assessment promotes a sense of *competence* by providing +/- performance feedback
- Assessment creates a sense of *internal locus of control* by providing a clear and attainable target and path to attaining it.
- Assessment creates a greater sense of *belonging and cooperation* among the members of the class.

In the coming few weeks of the class, you are asked to consider which assessment condition would be best suited to the work you are doing in this applied technology course. As you work and examine the dynamics of the class, ask yourself which of the three conditions would have the most sound and positive affect on your learning and the learning of the others in the class. In a few weeks you will be given a survey and provided the opportunity to share in a focus group.